PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	Confirmation No. 4903
	)	
Russell SMITH *et al.*	)	Group Art Unit: 1771
	)	
Serial No. 10/798,891	)	Examiner: Jeremy R. Pierce
	)	
Filed: March 12, 2004	)	Atty. Docket 006242.00043 (8605/USA)

For: USE OF PRE-COATED MAT FOR PREPARING GYPSUM BOARD

RULE 132 DECLARATION OF MR. RANDALL

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, BRIAN RANDALL, hereby declare that:

1. I am a citizen of the United States of America, residing in Lawrenceville, Georgia.

2. I am one of the listed inventors of the subject application.

3. I hold a Bachelor of Science degree in Management from Eastern Illinois University and have twenty-seven (27) years of industrial experience. I am currently a Product Technical Manager at G-P Gypsum, Inc.

4. I provide this testimony in support of the position that the pending claims define a coated fiber mat-faced gypsum board having a combination of properties that is neither disclosed, nor suggested by the references cited in the Office Action mailed May 2, 2006 in connection with the subject patent application.

5. The pending application was filed following our discovery of the critical inter-relationship of several important parameters on the structural integrity of coated fiber mat-faced gypsum boards, now reflected in the following claim, which I understand is now pending in the subject application:

> A fiber mat faced gypsum board made by
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> (1) contacting a gypsum slurry for forming a set gypsum core with
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> (2) a non-coated side of a pre-coated fiber mat, wherein the fiber mat has a thickness of between 0.02 and 0.045 inch and has a coating on a side opposite the non-coated side, said coating weighing about 30 to 100 pounds per 1000 square feet of mat and comprising a combination of (i) a mineral pigment, (ii) an organic binder and optionally (iii) an inorganic binder, the coating extending from a surface of said side opposite into said fiber mat a distance between about 30 and 50 percent of said thickness and having a microporosity, as measured by a modified Gurley method, of between 2 and 45 seconds, which allows air to flow through and water to evaporate through said pre-coated mat from the gypsum core during preparation of the board,
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> (3) wherein the contacting causes said gypsum slurry to penetrate into the non-coated side and through interstices of the fiber mat to fill said interstices with gypsum and form a bond between said gypsum and said coating, and
>
> (4) allowing the gypsum slurry to harden to form said set gypsum core, wherein the set gypsum core in a region near the bond has at least 17 percent combined water.

6. In particular, we have discovered that producing a gypsum board product where the strength between the coated mat facer and the board core is maximized requires a thoughtful balancing of the coating thickness (proportional to the coating weight), the coating penetration, the coating porosity and the extent of gypsum calcination in the vicinity of the bond between the coated mat and the gypsum core (directly relates to the combined water limitation). The prior art does not disclose, nor suggest the relative importance and inter-relationship of these parameters.

7. The process of making gypsum board of maximum structural integrity from a coated fiber mat and a gypsum slurry requires a careful balancing of the dynamic process by which the gypsum slurry invades the non-coated side of the mat and penetrates into the mat. The ease and completeness of that penetration is influenced by the microporosity of the coating on the mat, the thickness of that coating (which is directly proportional to the coating weight) and the proportion of the mat that had been penetrated by the coating.

8. If the microporosity of the coating on the fiber mat is too low, then the gypsum slurry does not adequately displace the internal air from the mat, *i.e.,* the air which fills the interstitial region of the fiber mat before the coating step ensues. With the air in its way, the gypsum slurry does not penetrate completely through the non-coated side of the mat to form a substantially complete interface and adequate bond with the surface of the coating that is internal to the fiber mat (*i.e.,* the interface between regions 31 and 32 in Figure 3 of the application). The failure of this process to form an adequate bond is illustrated by Figure 4 of the subject application.

9. The depth of the penetration of the coating into the mat also impacts the nature of the interaction between the gypsum slurry, the fiber mat and the coating on the fiber mat during the dynamic board formation process. A fiber mat having a coating which penetrates more than 50% of the thickness of the mat so-limits the degree of gypsum slurry penetration into the mat that the bond between the core and the mat suffers. At the opposite limit, if the coating penetration is less than 30% of the thickness of the fiber mat, then the gypsum slurry insufficiently penetrates the mat and can not form an adequate bond with the surface of the coating that is internal to the fiber mat (*i.e.,* the interface between regions 31 and 32 in Figure 3 of the application).

10. Finally, the microporosity of the coating on the fiber mat must not be too high, if it is then the gypsum slurry bleeds through the coating, often in a non-uniform fashion during the formation of the gypsum core. This bleed-through not only creates an unsightly surface on board and a clean-up problem for the manufacturing line, but it also interferes with later obtaining a satisfactory bond between the surface of the board and any decorative, *e.g.,* tiles, or functional elements, *e.g.,* insulation panels, that may be attached to the coated gypsum board.

11. My earlier published patent application, US 2002/0155282, while disclosing (1) overlapping values for mat thickness (paragraph [0038]), (2) overlapping values for coating weight (paragraph [0051]), (3) coating thicknesses of 4 to 30 mils (paragraph [0052], which can be urged to provide (though there is no disclosure of) overlapping values of coating penetration and (4) a functional need for sufficient porosity in the coating to allow water vapor to pass through the coating during board drying (paragraph [0058]), does not recognize the importance of a proper level of microporosity, particularly in relation to the other parameters, for maximizing board

integrity by positively influencing the dynamic process of slurry penetration during board manufacture.

12. In particular, coating morphologies suitable for permitting mat drying as described in paragraph [0058] of my earlier published patent application, US 2002/0155282 would not inherently be the same as the microporosity required by the pending claim. Indeed, both lower levels and higher levels of porosity in the coating would be suitable to satisfy the functional requirement for board drying. In this regard, Figure 4 in the subject application illustrates an embodiment that exhibited adequate drying, but inadequate slurry penetration.

13. Thus, from the disclosure of published patent application, US 2002/0155282, it is not apparent that there would be a combined set of parameters that would be ideal for allowing the slurry to penetrate through the mat to the surface of the coating that is internal to the fiber mat (*i.e.,* to the interface between regions 31 and 32 in Figure 3 of the application),

14. The importance of the calcination level in the board core in the vicinity of the interface between regions 31 and 32 in Figure 3 of the application also is not addressed by either my earlier published patent application, US 2002/0155282, or the cited Ali patent, US 4,647,486. Ali simply reports the known fact that chemically combined water in gypsum represents a first line of defense against fire. The 21% value of combined water reported in the Ali patent simply represents the full complement of that chemically combined water for gypsum ($CaSO_4 \cdot 2H_2O$= {[2x18/((2x18)+136)]x100%} or 21%. However, over-drying (calcining) of board is a common concern and reason to reject production in the manufacture of gypsum boards and Ali does not teach what importance such over-calcination might have on a fiber mat-faced board.

15. My earlier patent, US 6,808,793 (cited in the Office Action mailed May 2nd), has an identical specification to my earlier published patent application, US 2002/0155282 (the publication then matured into and thus is the same as US 6,770,354). Thus, the '793 patent has the same short-comings as described above in connection with my earlier published patent application. Similarly, the teachings in my co-pending application 10/417,344 have the same short-comings as described above in connection with my earlier published patent application, US 2002/0155282. None of these disclosures describe or suggest the critical inter-relationship of the recited parameters on the structural integrity of coated fiber mat-faced gypsum boards, as reflected in the pending claim.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: August 1, 2006

Brian Randall